$1.00

Simpson

INSTRUMENTS THAT STAY ACCURATE

OPERATOR'S MANUAL

WARNING

For safe usage, it is essential that the operator read this manual carefully before using the Instrument for any measurements.

MODEL 886
SOUND LEVEL METER

SIMPSON ELECTRIC COMPANY

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Area Code 312, Telephone 697-2260
In Canada, Bach-Simpson, Ltd., London, Ontario

New ! Simpson Model 461 Compact Portable DMM

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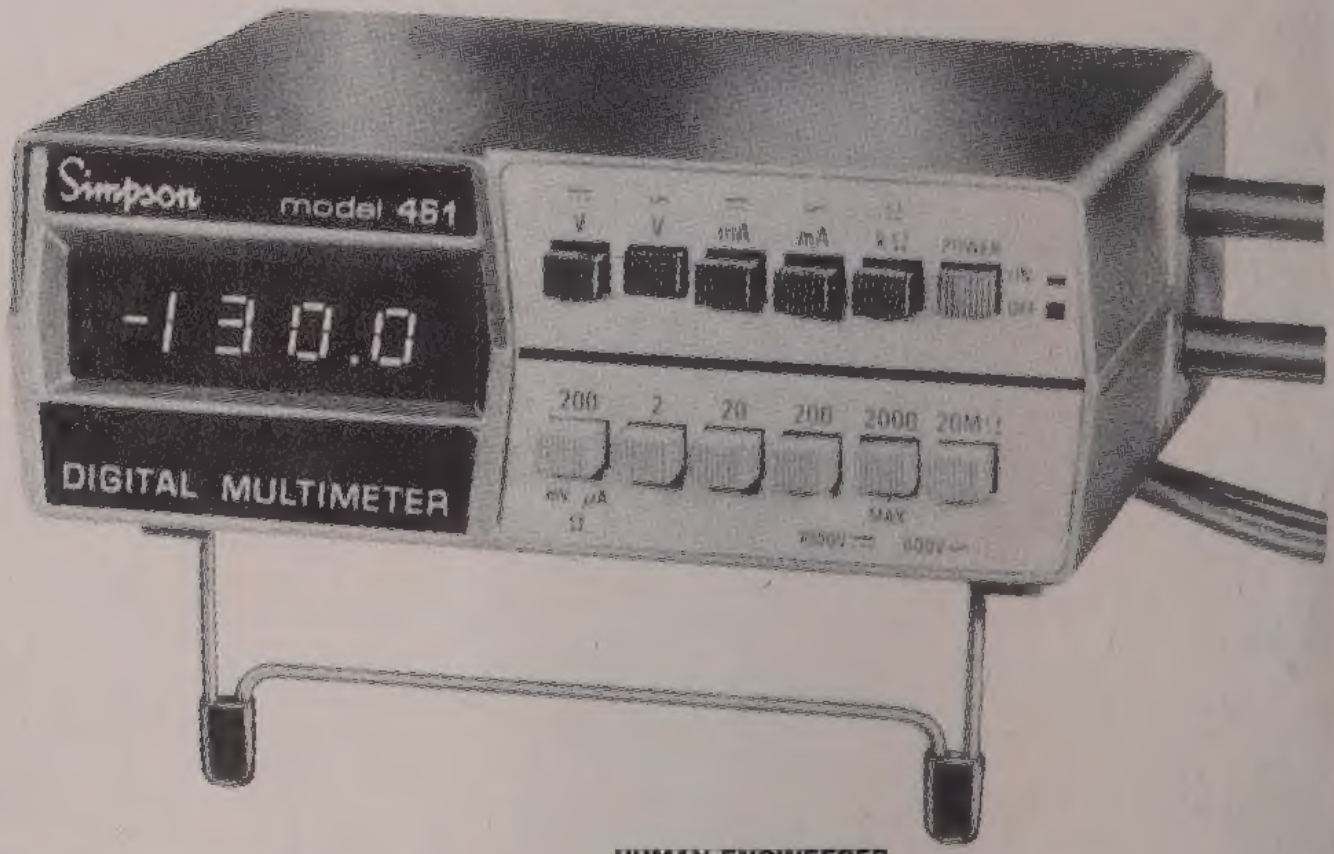

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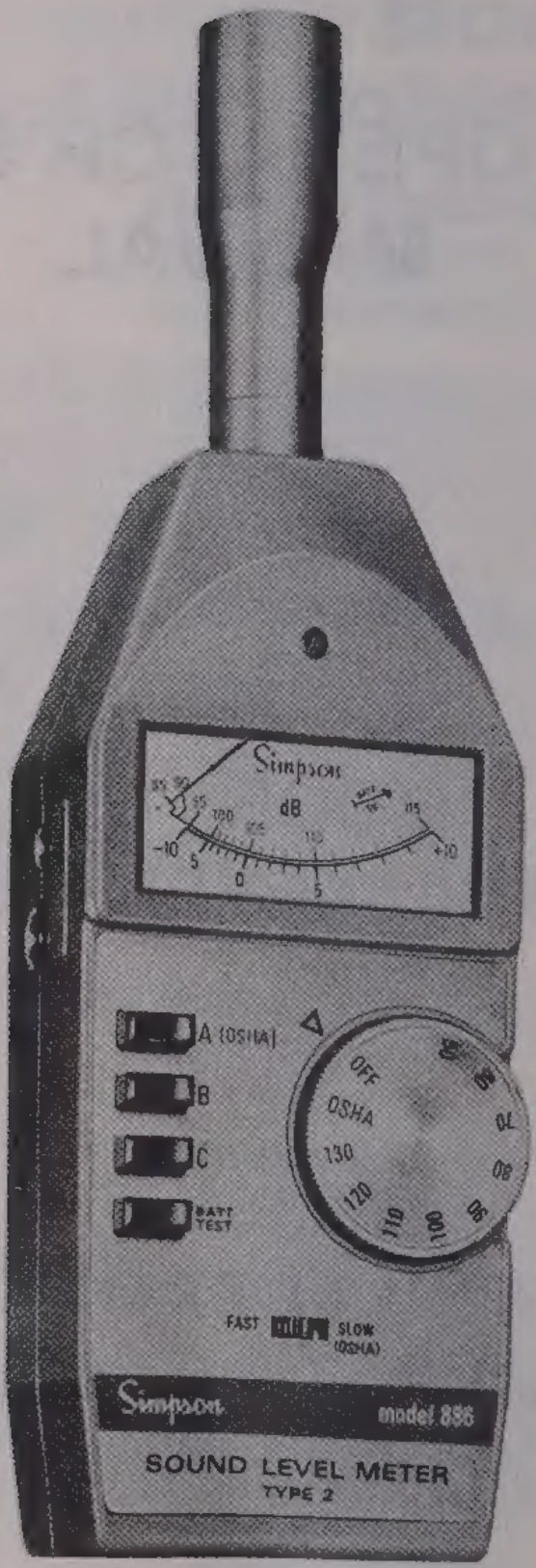

Figure 1-1. Simpson Model 886, Sound Level Meter

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SECTION I

INTRODUCTION

1.1 GENERAL

1.1.1 The Simpson Model 886 Sound Level Meter (see Figure 1-1) is a portable, general purpose sound level Instrument, capable of accurate sound level measurements over a range of 40 to 140 dB. This encompasses the noise level of a quiet residence to that beyond the threshold of pain. This dB range is compatible with current Federal, State and Local noise ordinance requirements; including safety and environmental noise checks. This Instrument is battery powered, compact, and its rugged construction permits its use in virtually any location.

1.1.2 The Model 886 meets the requirements of the American National Standards Institute (ANSI) Standard Specification S1.4-1971 for Type 2 General Purpose Sound Level Meters and the International Electro-Technical Commission (IEC) 123. It can be used by industry to measure noise levels to comply with the Occupational Safety and Health Act of 1970 (OSHA) and the Walsh-Healy Act, except for direct measurement of impact (impulse) noise. See paragraph 4.10.2.

1.1.3 The Model 886 can be hand-held for rapid testing or stably mounted on a tripod for measurements over extended periods of time. The microphone is detachable and can be extended from its case by use of an optional 25-foot microphone cable. The meter case is constructed of high-impact molded plastic, especially contoured at the microphone end to minimize reflections of the sound energy field being measured. The battery compartment is readily accessible without exposing the interior of the Instrument.

1.1.4 The Model 886 is provided with a range selector switch which references the 0 dB point of the indicating instrument to the range selected; for example, when the range switch is set to 70, the 0 portion on the black arc is equal to 70 dB. Pushbutton switches provide quick, direct selection of A, B, or C weighting networks and a battery check function. Fast or Slow meter response is switch selectable.

1.1.5 The use of advanced, solid-state electronics, a careful choice of components, and a special condenser microphone insure a stable design of excellent reliability, smooth frequency response and relative immunity to normal temperature and humidity changes.

1.1.6 An AC voltage (Table 1-1, item 7), proportional to meter pointer deflection, is available from an output jack (located on the right side of the Instrument). This voltage can be used for analysis of sound waves, remote measurements, interfacing with various commercially available sound measurement accessories (such as graphic level recorders, impulse noise analyzers) and other test equipment (see paragraph 5.4).

1.1.7 Two external filter output jacks (Table 1-1, item 10) allow the Model 886 to be used directly with the Simpson Model 888 Octave Band Filter Set for noise frequency analysis. With the Octave Filter Set, the sensitivity of the Sound Level Meter is extended an additional 20 dB to include sound pressure levels in the range of 20 dB.

1.2 ITEMS FURNISHED WITH SOUND LEVEL METER

All items required for operation are furnished with the Model 886 and listed in Table 8-1.

1.3 TECHNICAL DATA

Table 1-1 lists the technical specifications for the Model 886 Sound Level Meter.

Table 1-1. Technical Data

1. **Microphone:**

   Type: Condenser

   Size: Type L per ANSI S1.12-1967

   Impedance: 320 ohms ±20% at 23° C

   Directional Characteristics: Omnidirectional — Angle of incidence approximates a random response equal to 70°.

2. **Sound Level:**

   Measurement Ranges: 40 dB to 140 dB. Zero (0) dB reference is 20 μ newtons/m^2.

   NOTE: 0.0002 dynes/cm^2 or 0.0002 μ bar are equivalent to 20 μ N/m^2.

3. **Accuracy:**

   Meets ANSI specifications S1.4-1971 for a Type 2 Instrument and IEC 123.

4. **Weighting:**

   Three selectable networks modify overall frequency response to meet ANSI specification S1.4-1971 for the A, B, or C weighting curves for a Type 2 Instrument.

5. **Meter:**

   0-100 μA full-scale, taut-band movement with 2-1/2" dial having end markings of −10 dB and +10 dB,

and fifteen 1 dB scale markings. From −5 dB to +10 dB, the accuracy and scale marking comply with ANSI specifications S1.4-1971 for a Type 2 Instrument.

6. **Speed of Response:**

   Selectable "fast" or "slow" modes provide the response time required by ANSI specification S1.4-1971 for a Type 2 Instrument.

7. **Signal Output:**

   1.2 volts rms open-circuit, for a full scale meter indication. Source impedance is 620 ohms.

8. **Output Jack :**

   Mating Connector: A Switchcraft type 850 (Micro-Plug) subminiature phone plug.

9. **Distortion:**

   Less than 0.5% from 32 Hz to 8 kHz (meter pointer at full scale). Meter indication is unaffected by resistive loading of 620 ohms, or greater.

10. **External Filter :**

    Output: Designed for use with Simpson Class 2 Type E Octave Band Filter Set (Table 8-2) for frequency analysis of noise.

11. Calibration:

Screwdriver adjustable from side of case (see paragraph 7.6).

12. Power Requirements:

Two 9-volt batteries, NEDA 1604.

13. Battery Life:

Approximately 80 hours at 2 hours per day operation.

14. Temperature Range:

Operating Temperature: −10°C to +50°C
Storage Temperature: −40°C to +60°C (Batteries removed).

15. Temperature Influence:

−.03 dB/°C at 1 kHz.

16. Operating Humidity:

0 to 90% R.H.

17. Magnetic Field Influence:

A 50 or 60 Hz field of 1 oersted (80 A/m) will cause an indication of approximately 48 dB with C weighting when the Instrument is oriented for maximum sensitivity to the field.

18. Mechanical Construction:

Case is constructed of high impact plastic. Electronic circuits are packaged on two printed circuit boards.

19. Tripod Mounting:

Case equipped with 1/4-20" threaded insert (standard size for tripod mounting screws).

20. Weight:

1-1/4 lb. (.57 Kg)

21. Dimensions :

(with microphone attached): 3.03" wide x 10.07" long x 1.87" deep (77 x 255.8 x 47.5 mm).

SECTION II

INSTALLATION

2.1 UNPACKING AND INSPECTION

Prior to unpacking, examine the shipping carton for obvious signs of damage. Unpack and inspect the Instrument for possible external damage incurred in shipment. If no external damage is evident, check for internal damage as soon as possible. A test of the operating condition of the Instrument can be made after carefully reading Section V, noting all precautions, and conducting a preliminary sound level measurement of some local sound source. If there is any indication of external or internal damage, immediately file a complaint with the carrier. Make certain that all items in Table 8-1 are included in the shipment. Save the shipping carton and packing materials for storing or future shipping of the Instrument.

2.2 POWER REQUIREMENTS

2.2.1 The Model 886 is powered by two 9-volt batteries. Refer to Table 1-1, item 12, for specifications. The batteries are packaged separately. Refer to paragraph 7.3 for proper installation of batteries.

2.3 INSTALLATION

2.3.1 The Instrument, when in operation, may be either hand-held or mounted on a tripod. The physical position of the Instrument does not affect the accuracy.

2.3.2 Tripod or Strap Mounting

The Model 886 can be attached to any commercial, photography-type tripod having a standard 1/4-20" mounting screw. The mounting screw is aligned with the threaded insert in the case and finger tightened. A camera-type carrying strap (see Table 8-2) can be attached to the threaded insert. Carry the Instrument with the strap around the wrist to prevent accidental dropping.

2.3.3 Remote Microphone Mounting

A remote cable and microphone adapter (see Table 8-2) can be used to mount the microphone to any commercial, photography-type tripod for remote operation of the microphone.

CAUTION

Accuracy of measurement will be affected by several factors, one of which is the position of the microphone with respect to the sound source. Read Section IV carefully for general background information. See Section V for operation instructions for obtaining correct

SECTION III

CONTROLS, CONNECTORS AND OTHER OPERATIONAL ITEMS

3.1 GENERAL

All operating and adjustment controls, connectors, and other operational items are described in Table 3-1. Become familiar with each item prior to operating the Instrument for the first time (see Figure 3-1).

3.2 FRONT PANEL DESCRIPTION

Table 3-1 lists all front panel controls, connectors and other operational items.

Table 3-1. Controls, Connectors and Other Operational Items

1. **Range Switch:**

   An eleven position rotary switch used to activate the Instrument and to select the appropriate sensitivity. The range is indicated by the arrowhead. With the range switch set to the "OSHA" position, the dB level is read on the red arc displaying the OSHA range. With the range switch set to one of the black dB ranges, the black arc is used. A 0 indication on the black arc corresponds to either 130, 120, 110, 100, 90, 80, 70, 60 or 50 dB as determined by the position of the range switch. An indication other than 0 must be added to the range selected to obtain final level indication. For example, if the range switch is set to the 110 position, and the indication is +5, add +5 to 110

2. A, B and C Weighting Switches:

These are pushbutton switches for the selection of the frequency response of the Instrument in accordance with A, B, and C weighting requirements of ANSI Standard Specification S1.4-1971 for a Type 2 sound level meter. The weighting selected is indicated by a down position of the switch. The switches are arranged mechanically so that when one is pushed down, any other switch, previously depressed, automatically returns to the up position.

3. SLOW/FAST Slide Switch:

A slide switch for the selection of the response time of the meter circuit. Refer to Table 1-1, item 6, for slow and fast response times.

4. BATT TEST Switch:

A momentary pushbutton switch. When pressed, the meter is disconnected from the amplifier circuit and connected to the battery test circuit. The meter indicates battery condition.

5. Microphone:

A condenser type microphone that converts sound energy vibrations into electrical signals which are processed through the Sound Level Meter circuitry. Microphones are not inter-changeable; the Instru-

ment must be recalibrated when the microphone is changed.

Latch: The microphone can easily be detached by first pressing the microphone retaining latch. Refer to paragraph 7.5.

6. Signal Output Jack:

A sub-miniature type phone jack provides AC output. This AC output (Table 1-1, item 7) contains the weighted amplitude vs. frequency characteristics of the sound being measured.

7. External Filter Jacks:

A miniature type phone jack which is ahead of the meter circuitry permits a selectable external filter to be placed in the circuit ahead of the rectification circuits. A plug from the Simpson Model 888 Octave Band Filter Set connects with this jack. Upon connection, the jack automatically changes the electrical circuit response from "C" to flat (for 20 Hz to 20 kHz).

8. Meter:

0-100 μA DC full-scale, taut-band movement connected to the rectified output of the amplifier or battery test circuit (Table 3-1, item 5). The dial contains a dB scale with end markings of −10 dB and +10 dB and 1 dB divisions starting from −5 dB. The upper end of the scale includes a BATT OK section.

9. Calibration Adjustment:

Located under a metal cap on the side of the Instrument. A screwdriver adjustment for setting the gain of the internal amplifier (Table 1-1, item 11, and paragraph 7.6).

CAUTION

Do not change this adjustment. It must be made using a Simpson Model 890 Sound Level Calibrator or equivalent. This adjustment must always be made if a new microphone is used.

10. Battery Compartment:

The battery compartment, which is totally separated from the electronics, provides battery storage. The compartment cover is secured in place by two captive screws.

Controls, Connectors, and Indicators

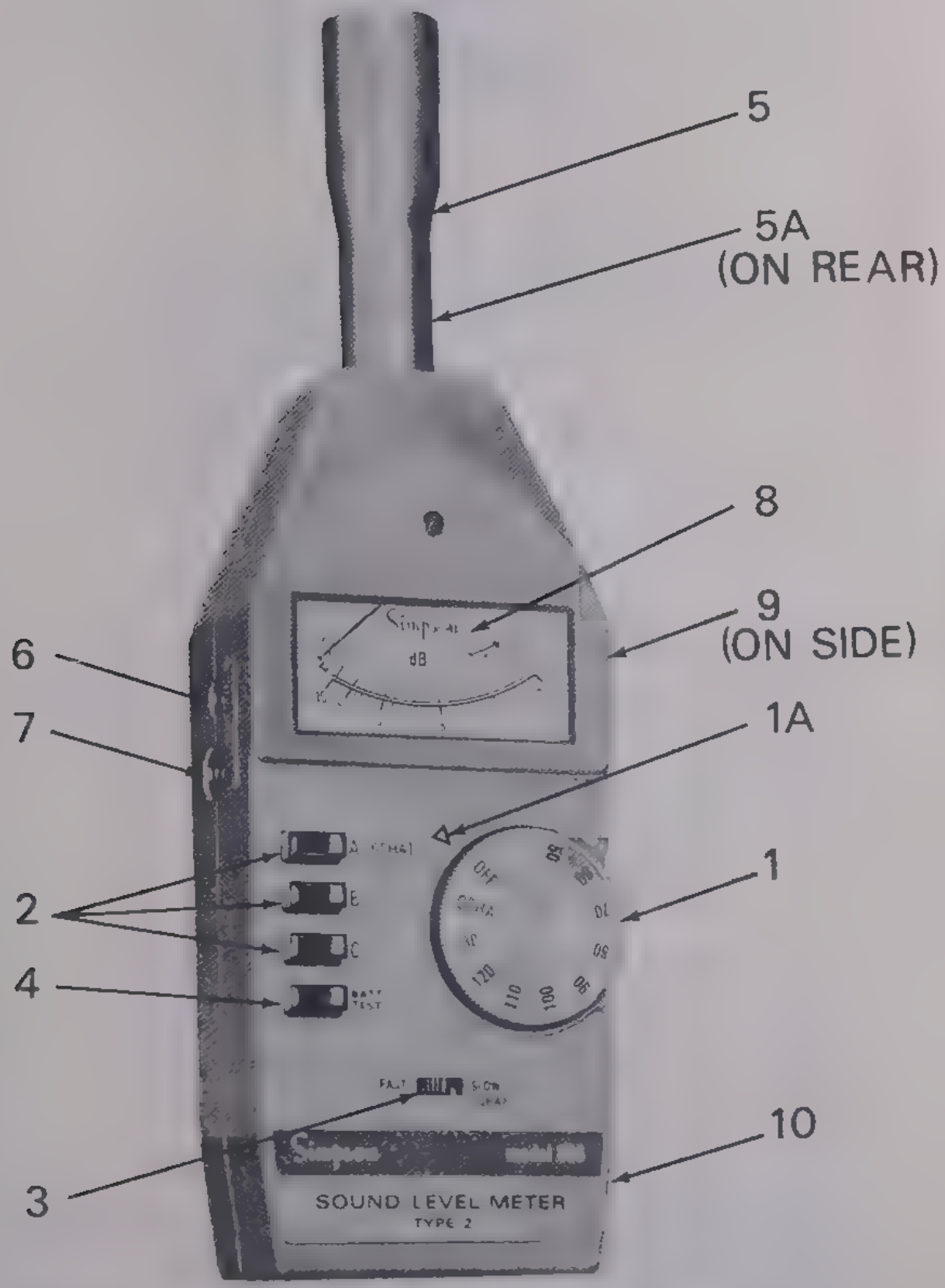


Figure 3-1. Model 886, Controls, Connectors and Other Operational Items

SECTION IV

OPERATING NOTES

4.1 GENERAL

This section contains basic information required for effective application of the Model 886 Sound Level Meter, and must be understood before attempting to perform the tests described in Section V.

NOTE: A bibliography pertinent to sound and noise measurements, standards and control is provided at the end of this section (see paragraph 4.13). It is recommended reading for those involved in noise survey measurements.

4.2 DECIBEL SCALE

The human ear has a mid-frequency dynamic sound sensitivity range of greater than one million to one, from the lowest level that can be detected to the highest that can be tolerated without pain. Because of the large ratio of value involved, a linear meter scale marked in pressure units becomes impractical. A scale based on logarithms, called a decibel (dB) scale, is used. This scale expresses the ratio between the sound pressure level being meas-

ured and a reference. It simplifies notation and manipulation by reducing large ratios into smaller convenient numbers. For example, a million-to-one pressure ratio can be expressed on a 0 to 120 dB scale.

4.3 MEASUREMENT AND EXPOSURE STANDARDS

4.3.1 The American National Standards Institute (ANSI), in collaboration with scientific and engineering societies, has established a standard, S1.4-1971, for conformance of all approved sound level meters. Federal, State and Local governments also have defined allowable noise (undesirable sound energy) level exposure limits for persons in industrial environments. Selected and applicable parts of those currently in force are cited in this manual.

CAUTION

Standards and government regulatory laws are subject to modification or expansion. Check for latest available documents and information.

4.3.2 ANSI S1.4-1971 takes into account the average response of the human ear which varies as a function of the intensity of sound. It groups intensity into three weighting curves; "A", "B" and "C". The "A" weighted curve more closely corresponds to the response of the ear at lower sound levels, while the "C" curve more closely corresponds to the human ear at the higher sound levels.

4.3.3 As indicated in Figure 4-1, the "B" and "C" weighting curves include more of the low frequency information. Thus at any level, measurements taken with various weightings can be compared in determining the frequency content of the noise. This is done by indicating the level in dB, accompanied by the weighting letter notation "A", "B" or "C", preferably in parentheses; e.g., 100 dB(A), etc.

4.3.4 Noise level exposure allowable limits, as required by the Occupational Safety and Health Act of 1970 (OSHA), the Walsh-Healy Act (Federal Register, Vol. 34 No. 96) and paragraph 1910.95 of the Occupational Safety and Health Standards (Federal Register, Vol. 36, No. 105, May 29, 1971), are shown in Table 4-1.

Table 4-1. Permissible Noise Exposure Limits*

Duration per day in hours	Sound level, dB(A) SLOW response
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or Less	115

*When daily noise exposure is composed of two or more periods of noise exposure at different levels, one must consider their combined effect, rather than the individual effect of each. If the sum of the following fractions: C1/T1 + C2/T2 . . . Cn/Tn exceeds unity, then consider the mixed exposure to exceed the designated limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level.

For compliance, exposure to impulsive or impact noise must not exceed 140 dB(A) peak sound level.

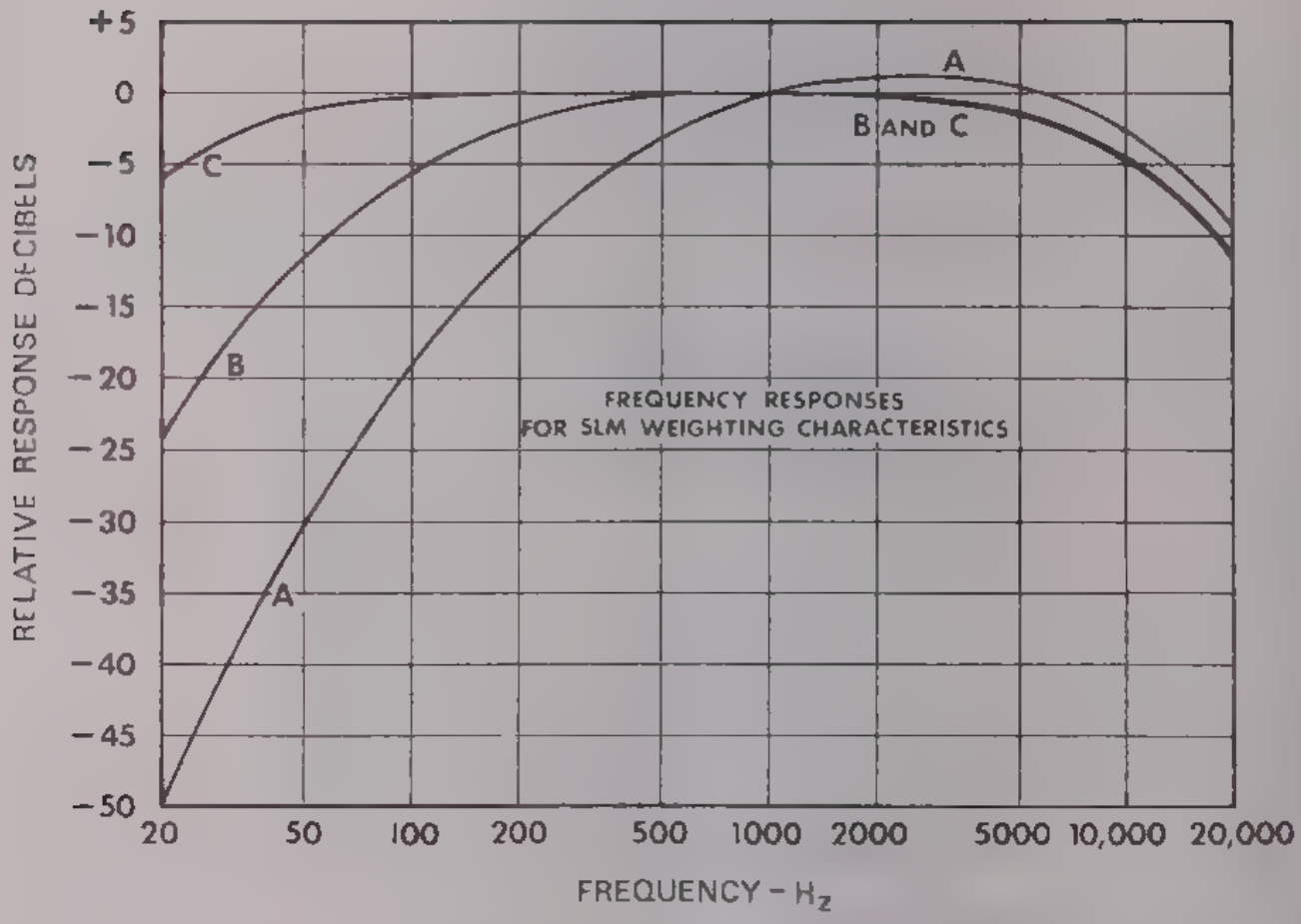


Figure 4-1. A, B and C Weighted Responses of the Sound Level Meter

4.4 SOUND FIELDS

4.4.1 Free Field

A Free Field contains no reflecting objects. Ideally it prevails around a point sound source located in free space. However, it can be considered to exist whenever the sound level being measured is caused mainly by sound waves coming directly from the sound source. This can occur even if there are reflecting objects, if measurements are made close to the sound source.

4.4.2 Reverberant Field

A reverberant field contains reflecting objects and the sound level being measured is caused mainly by reflections of the sound source. This usually occurs at a moderate distance from the sound source.

4.4.3 Semi-reverberant Field

This field is encountered most commonly and exists whenever the sound level being measured contains a significant amount of both reflected and direct sound waves.

4.5 MICROPHONE ORIENTATION

4.5.1 When making measurements in a free or semi-reverberant field, orient the microphone so that the angle of incidence, formed by incoming sound waves and axis of the microphone, is equal to the random incidence angle of the microphone. For the Model 886, this angle is 70° (a, Figure 4-2).

4.5.2 When making measurements in a reverberant field, orientation of the microphone is not critical. However, it is recommended that the operator use the same orientation (70°) as for the free or semi-reverberant field (see paragraph 4.5.1).

4.5.3 Vertical orientation of the microphone is not critical except where it is in line with a second sound source or a high-amplitude reflection of a

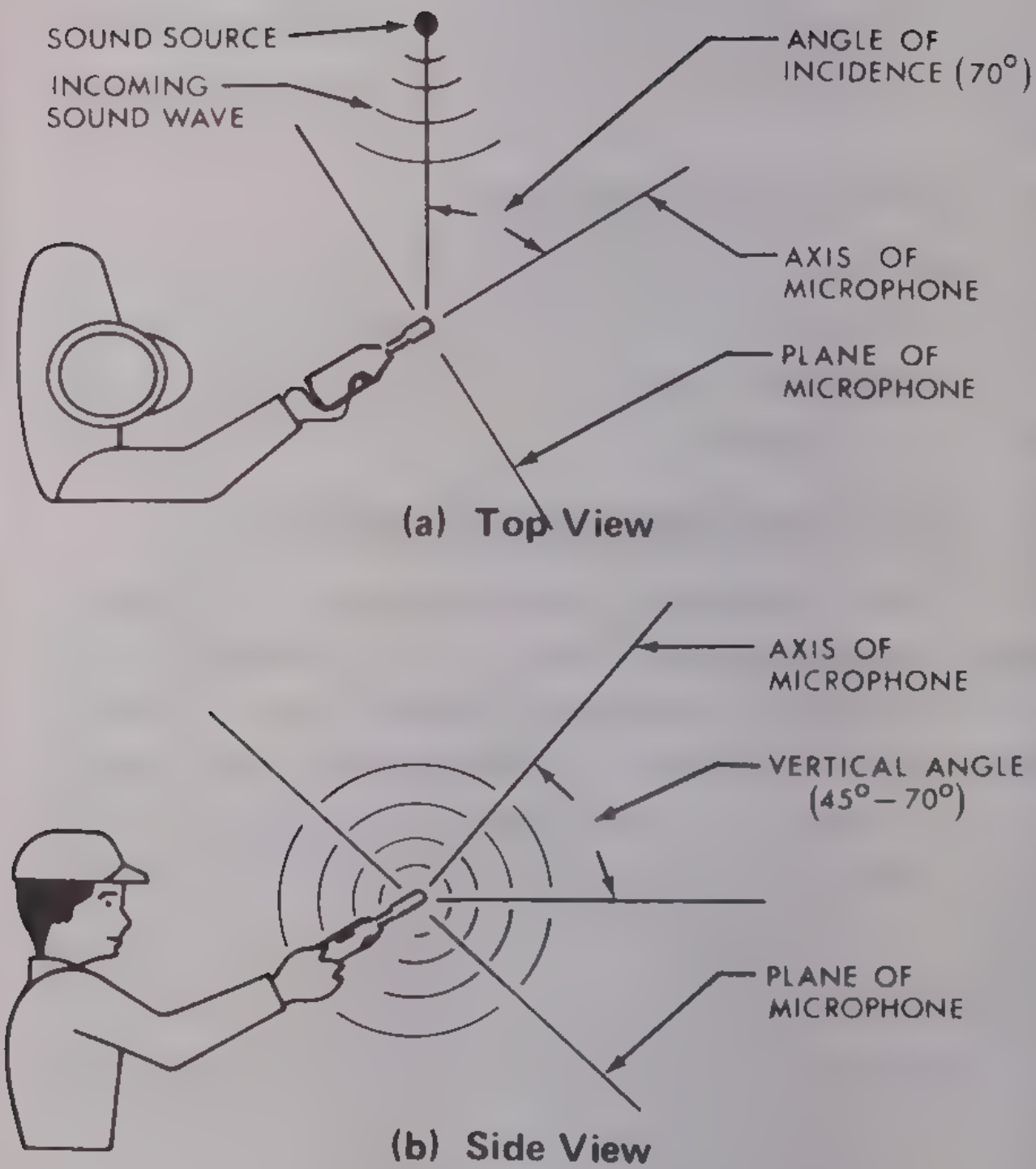


Figure 4-2. Orientation of Microphone and Operator with Respect to Incoming Sound Wave

sound source (see paragraph 4.5.4). It usually is invalidated by a second sound source, or by a nearby reflecting surface.

4.5.4 When evaluating a particular sound source, avoid holding the microphone in such a way that the reading is invalidated by a second sound source, or by the proximity of a nearby reflecting surface.

4.6 WIND SCREEN

When making measurements where wind is present, a low-frequency interference can be introduced by air passing across the microphone. Try to make measurements when wind is not present; if this is not practical, a wind screen should be employed. A wind screen accessory is available. See Table 8-2. When using this screen, indicated wind noise will be attenuated approximately 20 dB without seriously affecting the frequency response of the microphone.

NOTE: When making out-of-door measurements, usually it is preferable to point the microphone upward (to avoid interference from reflected high frequencies) and as far from the body as is convenient.

4.6.1 Grease and dirt on the wind screen will affect sound level measurements. To check for dirt or grease on the wind screen, measure the level of

continuous noise indoors with and without the wind screen in place. To clean the wind screen, wash with a mild detergent. Thoroughly rinse and dry before placing over microphone.

4.7 EFFECT OF OPERATOR'S PRESENCE

4.7.1 When sound is coming mainly from one direction, the reading might be affected by the relative positions of the microphone and operator. For example, if the operator and microphone are in line and facing the sound source, there can be a marked increase in response at high frequencies because the operator will act as a reflector and produce errors of several dB at frequencies above 100 Hz. A more uniform frequency response is obtained with the Instrument extended as far as conveniently possible in front of the operator, and the axis of the microphone oriented to form an angle of incidence of 70° with the incoming sound wave. Refer to paragraphs 4.4 and 4.5. Do not point the Instrument toward a source of noise other than the one being measured (paragraph 4.5.4).

4.7.2 The Model 886 (or its microphone) can be mounted on a tripod for further reduction in the effects of the operator's presence. See paragraphs

2.3.2 and 2.3.3. A practical arrangement is to tilt the microphone axis at an angle of approximately 45° to 70° with respect to the horizon. This allows the operator to step several feet or completely away and still be able to make measurements.

NOTE: Follow the same guidelines noted in paragraph 4.7.1 as to position of the operator relative to the Instrument.

4.8 METER FLUCTUATIONS

If the meter indication fluctuates more than 3 dB, set the meter response switch of the Instrument to the SLOW position unless otherwise specified in the applicable specification. Then if the fluctuations are less than 6 dB, record the average. If they are greater than 6 dB, record a value of 3 dB less than maximum indication. Infrequent, high peaks customarily are disregarded. When making noise survey measurements, record the highest peak also.

NOTE: As pointed out in Table 4-1, applicable standards require SLOW meter response when making noise surveys.

4.9 SELECTING A WEIGHTING CHARACTERISTIC

The Weighting characteristic must be selected according to individual application requirements. Noise codes and sound test procedures frequently specify the one to be used. For example: "A" weighting often is employed for measurement of speech interference by office and plant noise. Federal regulations such as the Walsh-Healy Act (paragraph 4.3.4) require use of the "A" response for all tests. When a standard test procedure is not involved, data can be taken with each of the three characteristics and thereby provide information on overall frequency content.

NOTE: If the weighting is not specified, common practice is to assume "A" weighting (ANSI S1.4-1971, Sect. 2). Be sure to indicate the weighting used on all recorded data.

4.10 IMPACT NOISE

4.10.1 Impact (impulse) noise refer to noise impulses of less than 1 second duration, occurring once or at intervals greater than 1 second, such as gunshots or drop-hammers. Usually they are measured with an impact meter which not only gives peak sound pressure level but also duration of the pulse.

4.10.2 Impulse noise measurements also can be made using an oscilloscope in conjunction with the Simpson Model 886. The oscilloscope is connected to the output jack and calibrated, using a steady sound source and correlating the scope deflection with the indication on the sound level meter.

4.10.3 A rough check of impulse noise having a duration greater than 5 milliseconds can be made with a sound level meter. It is set on "C" weighting, "FAST" meter response, and range switch in the 120 or 130 dB position. An indication of 125 dB is approximately equivalent to an actual impulse noise of 140 dB (limit established by the Walsh-Healy Act).

NOTE: Impulse noises having durations longer than 50 milliseconds and peak levels of 140 dB will give readings higher than 125 dB.

4.11 BACKGROUND NOISE

This is important when making product noise measurements and refers to the noise level remaining when the noise source being measured is removed.

4.12 DUAL SOUND SOURCES

When separate measurements are made on two sound sources, the combined effect cannot be predicated by direct addition. For example: If two

machines are emitting equal noise levels of 80 dB, the combined level will be 83 dB, not 160 dB. If the level of one source is 10 dB or greater than the other, then the lower level source can be disregarded as it will be "masked" by the higher level source. Information listed in Table 4-2 can be used for calculating the combined effect of the two sources. If more than two sound levels are involved, combine the highest two first, then combine the total with the next highest remaining sound level. Continue this procedure until all noteworthy levels are combined.

Table 4-2. Combining Noise Sources

Difference between levels in dB	No. of dB to be added to higher level
0	3.0
2	2.1
4	1.5
6	1.0
8	0.6
10	0.4

4.13 BIBLIOGRAPHY

a. "Industrial Noise, A Guide to Its Evaluation and Control" — U.S. Dept. of Health, Education, and Welfare, Public Health Service Publication No. 1572.

b. R. W. Young, "Can Accurate Measurements Be Made with A Sound Level Meter Held in Hand" — **Sound**, Vol. 1, No. 1, pp 17-24.

c. American National Standards Institute (ANSI) Standard Specification S1.4-1971.

d. Walsh-Healty Act, Federal Register, Vol. 34, No. 96, Dept. of Labor.

e. "Handbook of Noise Measurement" (6th Edition) — A.P.G. Peterson and E.E. Gross, Jr., General Radio Company, West Concord, Mass.

SECTION V

OPERATION

5.1 GENERAL

This section provides the instructions required for the operation of the Simpson Model 886 Sound Level Meter. Follow these instructions carefully to obtain accurate and useful data.

WARNING

If noise levels exceed 115 dB(A) (SLOW response), immediate use of protective ear muffs or plugs is required. According to the Occupational Safety and Health Act of 1970, noise that measures above 115 dB(A) is automatically "too high" for any length of exposure over approximately one second.

5.2 PRECAUTIONS

5.2.1 Read Section IV **prior** to performing measurements. This section contains important information on terminology, standards, techniques and precautions pertinent to sound and noise measurements.

5.2.2 Use Model 890 Calibrator to check the calibration of the Sound Level Meter periodically, especially if the Instrument has been subjected to severe mechanical shock or environmental extremes.

5.3 SOUND LEVEL MEASUREMENTS

To conduct sound level measurements, proceed as follows:

a. Rotate the Range Switch away from the OFF position, and depress BATT TEST button and note meter indication. If batteries are good, meter should indicate within BATT OK area on meter dial. If not, replace batteries (see paragraph 7.3).

b. When Instrument is hand held, orient the microphone approximately 45° to 70° with respect to horizontal position.

c. When Instrument is hand held, orient the microphone to take into account operator's position. Point Sound Level Meter at an angle of 70° with respect to incoming sound waves (see paragraph 4.5 and Figure 4-2).

d. For OSHA compliance measurement set FAST/SLOW switch to SLOW, the range switch to OSHA, and depress "A" pushbutton, Read exact dB(A) on red OSHA arc.

NOTE: If the meter indication is less than 105 dB, set the dB range switch to a more sensitive range. For example, a 95 dB reading on the OSHA range can be better and more accurately read on the 90 dB range.

e. Use the other dB ranges in conjunction with the FAST/SLOW switch to determine SLOW response if the meter fluctuations are in excess of 3 to 5 dB.

NOTE: With the range Switch set to any of the other range (black numerals), the black indicator, and the switch position corresponds to 0 indication. For example, if the switch is set to 90, and the indication is 5, add 5 to 90 to obtain 95 dB level.

f. Use the other weighting functions, by depressing the appropriate pushbutton switches, for specific noise measurements. Record the dB levels for comparison with Figure 4-1.

g. To conduct rough impact noise checks (see paragraph 4.10.3), set FAST/SLOW switch to FAST, dB range switch to 120, and depress "C" weighting button. Read peak reading on meter dial. A reading of 125 dB approximates an impulse noise of 140 dB, which is the upper limit established by the Walsh-Healy Act.

h. When not in use return the range switch to the OFF position and store the Sound Level Meter in a safe place (see paragraph 7.8.4).

5.4 USE OF AUXILIARY EQUIPMENT

5.4.1 The Simpson Model 886 can provide an output signal (see Table 3-1, item 6). The output is an amplified and weighted AC signal which corresponds to 1.2 volts with full scale pointer indication. For the operator's convenience, a Switchcraft type 850 micro-plug is furnished with the Instrument for connection of the output with auxiliary equipment, such as the Simpson Model 2745 Recorder, the Model 459 Oscilloscope, or other similar equipment.

WARNING

The Model 886 by itself does not constitute a shock hazard. However, if the Instrument is connected to any line operated auxiliary equipment, the auxiliary device must be properly grounded, or an electrical shock hazard may exist.

5.4.2 The larger of the two jacks on the side of the Model 886 (see Table 3-1, item 7) provides the filter input-output connection. This jack is only to be used in conjunction with the Simpson Model 888 Precision Octave Band Filter Set. The Model 888 is provided with a cable properly fitted for direct connection with the Model 886 (both jacks, items 6 and 7, Table 3-1 are utilized). The combination of the Model 886 and 888 Instruments allows noise analysis down to 20 dB.

SECTION VI

THEORY OF OPERATION

6.1 OVERALL SYSTEM

6.1.1 The basic system diagram for the Simpson Model 886 Sound Level Meter is shown in Figure 6-1. Air pressure vibrations caused by the sound source being measured are received by the microphone and converted into equivalent AC voltage variations. This signal is processed through the attenuator, amplifier and weighting circuits to achieve the required amplitude, stability and frequency characteristics. The signal then is applied separately to the output and rectifier circuits.

6.1.2 The AC voltage available at the Output Jack contains the weighted frequency and amplitude characteristics of the sound being measured. This signal can be used for interfacing with other instruments (paragraph 1.1.6 and 5.4).

6.1.3 The Rectifier Circuit rectifies the incoming AC to DC and passes it through the indicator as a calibrated current. The pointer indicates the sound level at the microphone in dB.

6.1.4 The operating voltages are derived from two 9 volt batteries which are checked by the Battery

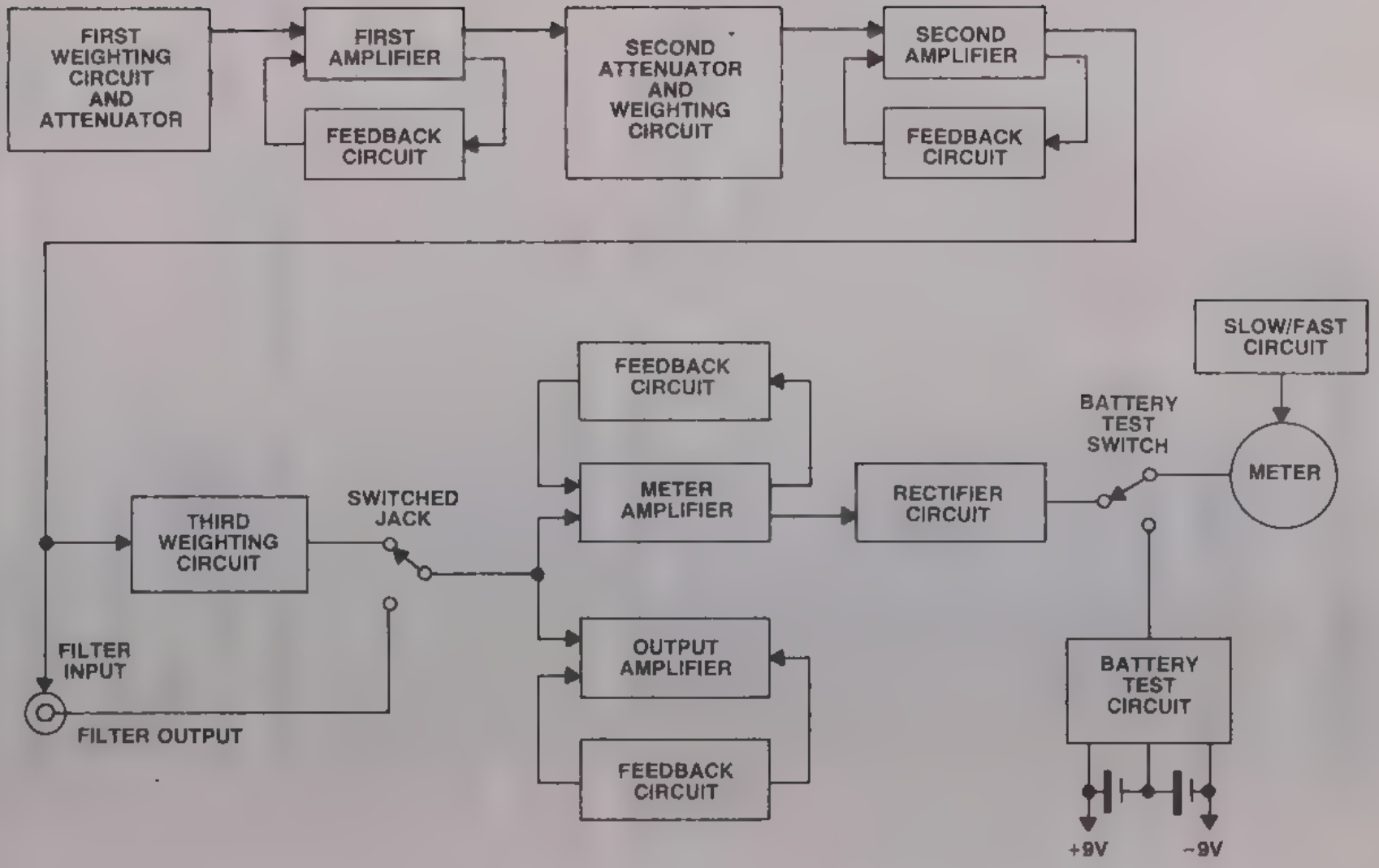


Figure 6-1. Model 886 Basic System, Block Diagram

SECTION VII

MAINTENANCE

7.1 GENERAL

The Model 886 Sound Level Meter has been designed using high-quality components. Reasonable care and the following of instructions contained in this manual will assure a long service life.

7.2 WARRANTY

The Simpson Electric Company Warranty policy is printed on the inside back cover of this manual. Read carefully before requesting a warranty repair.

NOTE: For assistance of any kind, including help with the Instrument under warranty, contact the nearest Authorized Service Center listed on the last pages of this manual or contact the Factory Service Manager. Give full details of the difficulty and include the model and serial number of the unit and date of purchase. Shipping instructions will be promptly sent to you. If an estimate of charges for non-warranty work or other service work is required, a firm quote estimate will be furnished upon receipt of the unit. Service work will not be performed without customer approval.

7.3 BATTERY REPLACEMENT

7.3.1 Turn the range switch to the "OFF" position.

7.3.2 Using a screwdriver or coin, loosen the two large captive screws located on Battery Compartment Access Cover and remove cover (see Table 3-1, item 10).

7.3.3 Remove both batteries from the compartment, and disconnect them from their common connector. Observe routing of connector cable with respect to batteries and Instrument.

7.3.4 Replace batteries observing proper polarity.

7.3.5 Install the battery assembly, with the connector on left side of the Instrument. Route cable between batteries and upper wall of battery compartment.

7.3.6 Replace the compartment cover.

7.4 KNOB REPLACEMENT

7.4.1 The SLOW/FAST switch cannot be removed without disassembling the case. The switch rarely will require replacement; if it does, send the Instrument to the nearest Simpson Authorized Service Center.

7.4.2 If a pushbutton knob is lost or broken, a replacement part (Table 8-2) can be purchased from any Simpson Authorized Service Center and installed as follows:

a. Slip a thin-bladed screwdriver between case and under edge of knob and lift upward.

b. Install new knob by mating its slot with switch shaft and pushing down until knob "bottoms" into position.

7.5 MICROPHONE REPLACEMENT

The microphone can be easily removed and replaced. For removal, press the microphone retaining latch and pull straight out. Obtain replacement microphone from any Simpson Authorized Service Center. See Table 8-2.

NOTE: Replacing or changing the microphone necessitates recalibration of the Instrument. See paragraph 7.6.

7.6 CALIBRATION

7.6.1 If necessary, return the Instrument to factory for checking and recalibration. The Simpson Model 890 Sound Level Calibrator is recommended for use by those planning to perform their own calibration.

7.6.2 The calibrating procedure for the Model 886 is covered in the Operator's Manual for the calibrator. Basically, it consists of mechanically coupling the calibrated 1 kHz output of the calibrator to the microphone of the Sound Level Meter, and adjusting the calibration control for a meter indication equal to the specified output of the calibrator.

7.7 TROUBLESHOOTING

Special training and facilities are required for servicing and calibrating Sound Level Meters. Whenever the Instrument does not appear to be functioning properly, send it to your nearest Simpson Authorized Service Center. Do not disassemble the case because it contains no user-serviceable parts.

7.8 PREVENTIVE MAINTENANCE

7.8.1 Daily Care:

a. Immediately remove all materials spilled on the Instrument and wipe dry. If spillage is corrosive, use a suitable cleaner to neutralize corrosive action before removing spillage.

b. To protect the microphone, keep sharp objects away from the top. Never rest the unit on the microphone. If the microphone is detached, always lay it on its side.

c. Whenever the Instrument is not in use, set the range switch to the OFF position.

d. Avoid prolonged exposure or usage in areas subject to temperature and humidity extremes, vibration, mechanical shock, dust, corrosive fumes, and strong electrical or electromagnetic interferences.

7.8.2 Monthly Care:

a. Verify Instrument calibration by using an accurately known sound-energy source. If recalibration is indicated, it can be accomplished as explained in paragraph 7.6.

b. If the Instrument has not been used for 30 days, check batteries for leakage and replace if necessary (see paragraph 7.3).

7.8.3 Annual Care:

It is recommended that the Instrument be returned to your nearest Simpson Authorized Service Center, or directly to the factory, annually (sooner if required) for a complete overall check, adjustment and calibration.

7.8.4 Storage:

When the Instrument is not in use, store it in a room free from temperature extremes, dust, corrosive fumes, mechanical vibration or shock. If storage time is expected to exceed 30 days, remove the batteries.

SECTION VIII

ACCESSORIES, REPLACEMENT PARTS AND SCHEMATIC DIAGRAM

Table 8-1. Items Furnished With the Instrument

Quantity	Description	Catalog or Part No.
1	Model 886 Sound Level Meter Complete with Microphone	12620
1	Micro plug, Switchcraft type 850	*
2	9 volt batteries, NEDA 1604	**
1	Operator's Manual	5-117264

*Available from local electronic part distributors.
**Available from local retail stores (transistor radio type).

Table 8-2. Accessories and Replacement Parts

Quantity	Description	Catalog or Part No.
	Cover Assembly, Battery Compartment	10-560219
	Screwdriver	5-116470
	Wriststrap	00576
	Windscreen	00197
	Calibrator, Model 890	12619
	Carrying Case	00217
	Adapter, Microphone to tripod	00184
	Microphone Extension Cable	00198
	Microphone Assembly	00183
	Octave Band Filter Set, Model 888	12617

Table 8-3. Replacement Parts List

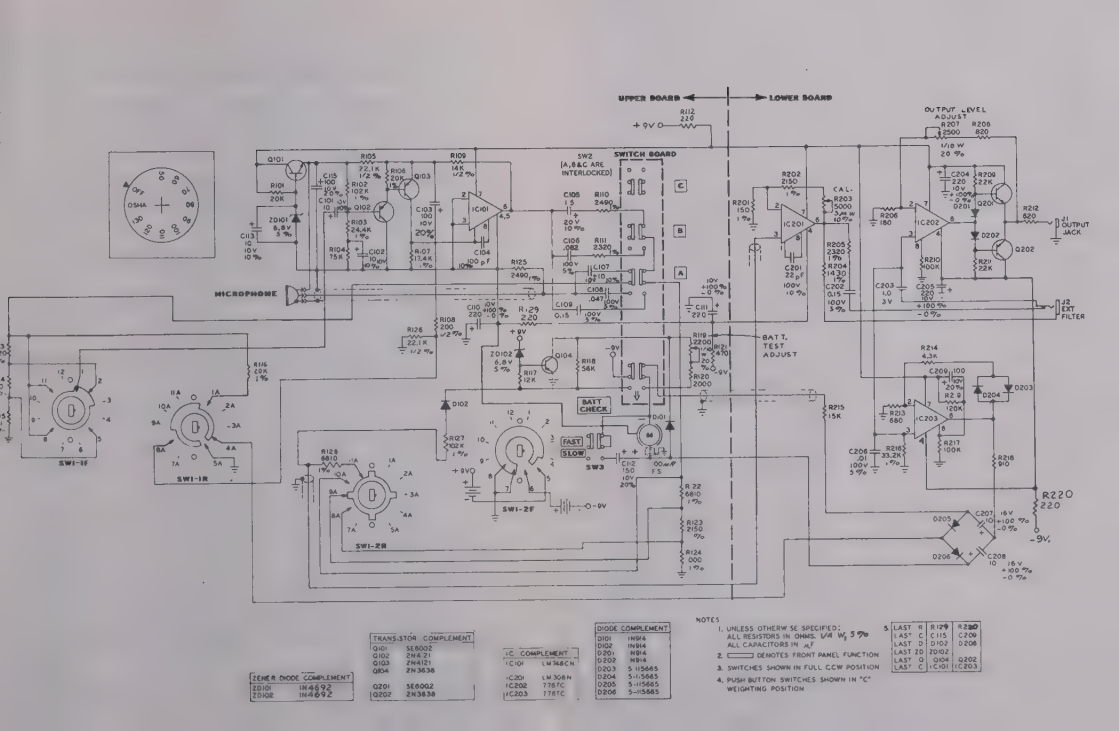
Reference Symbol	Description	Simpson Part No.
R101	Resistor, 20 kΩ ±5%, 1/4W	5-117283
R102-127	Resistor, 102 kΩ ±1%, 1/4W	5-117275
R103	Resistor, 24.4 kΩ ±1%, 1/4W	5-117273
104	Resistor, 75 kΩ ±5%, 1/4W	5-115437
R105-2b	Resistor, 22.1 kΩ ±1/2%, 1/4W	5-117295
R106-116	Resistor, 20 kΩ ±5%, 1/4W	5-116621
R107	Resistor, 17.4 kΩ ±1%, 1/4W	5-117272
R108	Resistor, 200Ω ±1/2%, 1/4W	5-117268
R109	Resistor, 14 kΩ ±1/2%, 1/4W	5-117274
R110-125	Resistor, 2490Ω ±1%, 1/4W	5-117270
R111	Resistor, 2320Ω ±1%, 1/4W	5-117269
R112-129	Resistor, 220Ω ±5%, 1/4W	5-117179
R113	Resistor, 5620Ω ±1%, 1/4W	5-117271
R114	Resistor, 150Ω ±1%, 1/4W	5-117266
R115	Resistor, 191Ω ±1%, 1/4W	5-117267
R117	Resistor, 12 kΩ ±5%, 1/4W	5-117194
R118	Resistor, 56 kΩ ±5%, 1/4W	5-117197
R119	Resistor, Variable 2200Ω ±20%, 1/10W	5-117198
R120	Resistor, 2000Ω ±5%, 1/4W	5-115460
R121	Resistor, 470Ω ±5%, 1/4W	5-116093
R122-128	Resistor, 6810Ω ±1%, 1/4W	5-117191
R123	Resistor, 2150Ω ±1%, 1/4W	5-117189
R124	Resistor, 1000Ω ±1%, 1/4W	5-115490
R201	Resistor, 150Ω ±1%, 1/4W	5-117266
R202	Resistor, 2150Ω ±1%, 1/4W	5-117189

R203	Resistor, Variable 5 kΩ ±10%, 3/4W	5-117199
R204	Resistor, 700Ω ±1%, 1/4W	5-115977
R205	Resistor, 2320Ω ±1%, 1/4W	5-117269
R206	Resistor, 180Ω ±5%, 1/4W	5-116090
R207	Resistor, variable, 2500Ω ±20%, 1/10W	5-117051
R208	Resistor, 820Ω ±5%, 1/4W	5-117186
R209-211	Resistor, 22 kΩ ±5%, 1/4W	5-117196
R210-217	Resistor, 100 kΩ ±5%, 1/4W	5-117276
R212	Resistor, 620Ω ±5%, 1/4W	5-117296
R213	Resistor, 680Ω ±5%, 1/4W	5-116095
R214	Resistor, 4300Ω ±5%, 1/4W	5-117304
R215	Resistor, 15 kΩ ±5%, 1/4W	5-116134
R216	Resistor, 32.2 kΩ ±1%, 1/4W	5-114964
R218	Resistor, 910Ω ±5%, 1/4W	5-117187
R219	Resistor, 120 kΩ ±5%, 1/4W	5-113627
R220	Resistor, 220Ω ±5%, 1/4W	5-117179
C101-102 -107-113	Capacitor, 10 μF ±10%, 10W VDC	5-117280
C115	Capacitor, 100 μF ±20%, 10W VDC	5-117306
C103	Capacitor, 220 μF 20%, 10W VDC	5-118953
C104	Capacitor, 100 pF ±10%, 500W VDC	5-113201
C105	Capacitor, 1.5 μF ±10%, 20W VDC	5-115276

C106	Capacitor, .082 μF ±5%, 100W VDC	5-117277
C108	Capacitor, .047 μF ±5%, 100W VDC	5-117202
C109	Capacitor, .15 μF ±5%, 100W VDC	5-117279
C110-111	Capacitor, 220 μF +100%, 10W VDC	5-117208
C112	Capacitor, 150 μF ±20%, 10W VDC	5-117207
C201	Capacitor, 22 pF ±10%, 100W VDC	5-117200
C202	Capacitor, .15 μF ±5%, 100W VDC	5-117279
C203	Capacitor, 1 μF GMV, 3W VDC	5-117281
C204-205	Capacitor, 220 μF +100% −0% 10W VDC	5-117208
C207-208	Capacitor, 10 μF +100%, 16W VDC	5-117205
C209	Capacitor, 100 μF ±20%, 10W VDC	5-117306
D101-102	Diode, Silicon 1N914	5-112004
D201-202	Diode, Silicon 1N914	5-112004
D203-204 -205-206	Diode, Germanium, special	5-115665
ZD101-102	Diode, Zener, 6.8V, IN4692	5-117399

Q101	Transistor, Silicon, NPN, SE6002	5-114463
Q102-103	Transistor, Silicon, PNP, 2N4121	5-115939
Q104	Transistor, Silicon, PNP, 2N3638	5-114106
Q201	Transistor, Silicon, NPN, SE6002	5-114463
Q202	Transistor, Silicon, PNP, 2N3638	5-114106
IC 101	Integrated Circuit, Operational Amplifier LM748CN	5-117252
IC 201	Integrated Circuit, Operational Amplifier LM308N	5-116598
IC202-203	Integrated Circuit, Operational Amplifier 776TC	5-117253
SW1	Switch, rotary, 2 sections, 11 position (less Index Assembly	5-117262
	Switch shaft and Index Assembly for SW1	5-117263
SW2	Switch, pushbutton, DPDT, 1 momentary and 3 interlocked sections	5-117299
SW3	Switch, slide, DPDT	5-117169
M	Indicating Instrument, 100 μA	15-313701

B1-2	Battery, 9-Volts, NEDA 1604	*
	Knob, Range Switch (SW1)	5-117171
	Set, Set, #4-40 +1/4" hex socket	5-110326
	Button, push, for SW2 (required)	5-117303
	Overlay, panel graphics	5-117282
	Plate, range knob graphics	5-117249
J1	Jack, miniature phone with knurled nut	5-117326
J2	Jack, miniature phone with knurled nut	5-117255



TRANSISTOR COMPLEMENT	
Q101	SE9002
Q102	2N4121
Q103	2N4121
Q104	2N3638
Q201	SE9002
Q202	2N3638

ZENER DIODE COMPLEMENT	
ZD101	IN4692
ZD102	IN4692

I.C. COMPLEMENT	
IC101	LM 368 CN
IC201	LM 308 N
IC202	7151C
IC203	7161C

DIODE COMPLEMENT	
D101	IN914
D102	IN914
D201	IN914
D202	IN914
D203	5-115665
D204	5-115665
D205	5-115665
D206	5-115665

NOTES

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS IN OHMS, 1/4 W, 5%
   ALL CAPACITORS IN μF
2. ▭ DENOTES FRONT PANEL FUNCTION
3. SWITCHES SHOWN IN FULL CCW POSITION
4. PUSH BUTTON SWITCHES SHOWN IN "C" WEIGHTING POSITION

5	LAST R	R129	R280
	LAST C	C115	C209
	LAST D	D102	D208
	LAST ZD	ZD102	
	LAST Q	Q104	Q202
	LAST IC	IC101	IC203

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☐ ELECTRICAL INSTRUMENT METER COMPANY (EIMCO)
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Tel. 713/526-6871 & 72

★★★**TEXAS, HOUSTON 77021**
☐ METERS & INSTRUMENTS CORP.
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☐ E.I.L. INSTRUMENTS, INC.
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Tel. 703/354-4330

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☐ EICHER-RICHARDS COMPANY
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13215 S.E. 30th
P.O. Box 3097
Tel. 206/747-9410

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★★★**WISCONSIN, MILWAUKEE 53202**
THE ELECTRO MECHANO COMPANY
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Warranty

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